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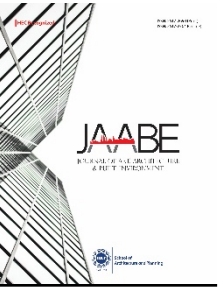

Title:	**Impacts of Pandemic on Urban Pedagogy, Research, and Practice: Online Studio Pre-Requisites, Opportunities, and Pitfalls**
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Impacts of Pandemic on Urban Pedagogy, Research, and Practice: Online Studio Pre-Requisites, Opportunities, and Pitfalls.

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Abstract

Online studios gained popularity in the wake of the spread of COVID-19 pandemic. Physical "lockdown" of Higher Educational Institutions (HEIs) forced the Higher Education Commission (HEC), Pakistan to allow universities to carry on learning and examination through the online mode. HEC developed protocols and in consultation with university administrations recommended faculty training, procedural formulation, and technology development requirements for the continuation of online classes and examination. This initiative motivated the departments and schools of architecture in different universities to undertake online classes as well as studios. Pakistan Council of Architects and Town Planners (PCATP), the accreditation body, laid down further protocols for conducting online studios and juries. Thus, between spring 2020 and spring 2021 an online studio pedagogy emerged. The current study brings together thinking, experiences, and viewpoints on online studio pedagogy through a review of webinars and online documentation, conducted along with the interviews of professionals, academics, and students. The main objective of this research is to verify the significance of online studio vis-à-vis studios and juries conducted physically. It also aims to delineate the pre-requisites, opportunities, and risks involved in online studios in the context of Pakistan. Students' feedback on the importance and preference of online or physical studio was collected through online survey and face to face (F2F) discussion. SPSS was used to correlate the variables. The study would help studio instructors and learners to improve their capabilities, equipment, environment, and daily discipline. Moreover, it is also expected to contribute in the discussion on National Curriculum development towards a more realistic, relevant, and resource efficient means for architectural education.

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Keywords: architectural education, COVID-19 pandemic, efficient means, online studio, Pakistan Council of Architects and Planners (PCATP)

Introduction

Pakistan is a developing country and gradually integrating into the globalization process. It has 207.68 million population with 19.19% people in the age group of 15-24 years. It is from this age group, termed as youth in the Population Census 2017 (Pakistan Bureau of Statistics [PBS], 2021), the users of the design studio emerge as the future architects and planners of the built environment. Larger part of the population lives in rural areas and a small percentage in remote regions. The majority of Pakistan's households belong to the poor and low-income communities. Pakistani youths' studying in universities and institutions of higher learning are less than 6% of the total youth population (United Nations, 2018).

Architectural schools in Pakistan are of two types, that is, those located within art based institutions and those in the engineering universities. There is a further division of private and public sector institutions. However, the Architectural curriculum and pedagogy are the same. The main difference is that the foundation year of the Architectural schools in art based institutions is more aligned with arts. There are 6 institutions with Architectural schools in Karachi, namely Dawood University of Engineering and Technology (DUET), Indus Valley School of Art and Architecture (IVSAA), Karachi University (KU), Nazeer Hussain University (NHU), NED University of Engineering and Technology (NEDUET), and Sir Syed University of Engineering and Technology (SSUET).

An architect's primary activity is to design. Resultantly, the most important key element of Architectural Education is the process of learning to design (Ceylan et al., 2021). The design studio is the forte of Architectural Education. The significance of design studio then needs to be understood in the context of architectural pedagogy. The design studio in Pakistan, as part of the Architectural Curriculum 2012-13, is a project based learning (Higher Education Commission [HEC], 2013). In this Project Based Learning (PBL) method, learners engage in resolving realistic and complex problems or challenges. Review of the HEC curriculum 2012-13 shows that PBL method is reinforced in the design studio by Focus Studios and Thesis (Higher Education Commission [HEC], 2013). In the semester

system, Architectural Education is defined by credit hours, with one studio hour equivalent to two hours of work in the studio. The proportion of studio hours' form 46% of the total 180 credit hours spread over 5 years or 10 semesters. Combined with credit hours of drawing studios, studio takes up almost 50% of credit hours and 2/3rd of contact hours. The HEC curriculum 2012-13 also emphasizes the theory and history, allied technology, and communication and practice as supporting knowledge based courses to the PBL design studio.

Online studios gained popularity during lockdown due to COVID-19 pandemic, a term that majority of us never heard of and was rarely used, entered our vocabulary (Ozorhon, & LEKESİZ, 2021) and many institutes of higher learning shifted to online classes (Ibrahim et al., 2021). In Sindh, at the onset of COVID-19 in March 2020, Sindh Government announced an early summer vacation in March. Since the pandemic continued to spread, educational institutions with online learning capabilities were allowed to open in July 2020. During the early summer vacation, majority of the universities prepared themselves to work online. This was new for the faculty members and students of Architecture. The current paper presents how the architectural schools learned to cope with online learning and developed capabilities to use those resources in order to improve design studio pedagogy.

Literature Review

Salama and Wilkinson (2007), while discussing the future of design studio pedagogy, pointed out that design studios develop the skills and critical thinking which are necessary for "shapers of the built environment" to respond to demands of the society. The skills and thinking processes help the architects and planners to conceptualize and construct the built environment rooted in "humane traditions" which is an idea made obsolete by advancing technology that is rapidly propagating artificial intelligence and automation. It is in this context of advancing technology that the current study analyzed the design studio pedagogy. Salama (2007) pointed out that the inquiry into design studio performance shows that academia misses the opportunity to learn from real life and barricades themselves or remains at a distance from "rich human experiences". Jenson (2007) supports the argument saying Architectural Education and practice insists on originality and fantastic designs that aim to amaze and shock people rather than upholding civic responsibilities.

The study of evolution of Architectural academic and more specifically design pedagogy shows that there are four approaches to learn Architecture, namely academic, crafts, technological, and sociological (Salama, 2007). The 'Academic' method stresses on the formal composition of spaces learned through history and theory. This 'Academic' pedagogy is most practiced in Pakistan. This form of instruction became the basis of architectural education due to its popularity and insistence by renowned Pakistani Architects who were trained abroad. This approach was rejected by some schools for the sociological based pragmatic approach. The Department of Architecture and Planning, Dawood College of Engineering and Technology (DAP-DCET) is a pioneer in the sociological based design approach, which responds to the functional aspects and is in relation with the physical and social context. The graduates from DAP-DCET now hold decision-making positions in many schools of Architecture and more specifically NED University has expanded and built upon this approach. Technological approach, focusing on the engineering aspects of design, remains a forte for few architectural schools even though they are located in Engineering universities. The crafts based approach to design is practiced by few and taught by fewer. This is despite PCATP's insistence on model making, carpentry, and exploration of materials. In all four types of Architectural approaches though, the objectives may differ, the Design Studio remains central to learning Architecture (Salama, 2007).

In going beyond the technological, crafts, and aesthetic approaches to Architectural design, an interdisciplinary approach is necessary as there are several types of built environment professionals who must work together. Jenson (2007) argues that in interdisciplinary approach, bounds of specialization should not be blurred, however, continuously transformed to accommodate working together. However, as the present Architectural education is heavily influenced by the European Guild system, the Design Studio instructors tend to create a sense of brotherhood and enforce standards of quality and identity, and overcome challenges through a specific method. The method focuses on face to face (F2F) drawing centered method of learning through 'crits' (critique). The promotion from year 1 to 5 and even after graduation is also marked by the Guild format of apprentice, journeyman, and master (Jenson, 2007).

Wragg (n.d.) refers to the 'idea and culture' of design studio as the basis of architectural education and practice. This culture is motivating, informal,

and supporting. The participants in the Design Studio learn from each other and inspire and support one another. Moreover, they also develop a collegial attitude towards visually centered learning. However, this dedicated space for learning is disappearing due to larger student cohorts, back-to-back classes, and significantly reduced contact hours. Wragg proposed the virtual design studio as an alternative while pointing out to gauge the students' expectations rather than assuming that they would be comfortable with the virtual design studio.

Pakistan Council of Architects and Town Planners (PCATP) in the introduction of their survey report (Pakistan Council of Architects and Town Planners [PCATP], 2020a) mentioned that Architects, Planners, Engineers, and other professionals shape the built environment in which people live and work. The training of these professionals, particularly of Architects provides them knowledge and abilities to resolve complex problems of the society using "creativity and design". Furthermore, the skills help the Architects to design spaces that are functional, respond to climate, and culture and brings benefits to users and values to client.

The design studio classes are the foundation of architectural education. In these classes, students test concepts, create 3-D objects, and suggest design proposals in a collaborative and creative setting. This status quo was severely disrupted by the COVID-19 epidemic in 2020 which necessitated a significant change in how instruction and learning are conducted in design studios overall (Komarzyńska-Świeściak et al., 2021).

Online studios help to bring architectural education closer to real life and also help to dilute the barrier between reality and imagination. This helps academia to integrate systemic thinking into architectural education. However, the existing curriculum should be reviewed and modified as a pre-condition for developing systemic thinking.

The fact that Pakistan lags behind many other countries in meeting the Sustainable Development Goals (SDGs) points to the inability of the professionals to make an impact on the design, planning, and development process in Pakistan. One reason may be the small numbers of professionals which is 0.03 per 1000 population as compared to 0.455 Architects per 1000 population. Another is the capacity of the trained professionals. The sample survey of architects and town planners in Pakistan shows that few were able to come up with correct answers to key questions.

Methodology

The current study is based mainly on available and accessible online studies and reports, and draws the data from discussions with faculty members and students from SSUET, NED-UET, and IVSAA. A sample of 70 Architecture students was used to collect the data. A chi-square test, performed with SPSS, was used to assess how well students responded to the four criteria of participation in learning, learning autonomy, learning quality, and positive changes in learning behaviors. A correlation analysis was conducted to determine the relationship between the students' level of study and their satisfaction with the online and physical studios. Furthermore, being part of many online groups on Architecture and Education and having attended Architectural and Educational webinars and read reports on them along with viewed and attended online courses, the knowledge and observations presented here were derived from them.

There is a rich knowledge based on internet which helps to shape the opinions and thoughts of the policy makers and policies are being formed based on international experiences. The current research fuses the knowledge with local wisdom and cultural trends to analyze and conclude the online experiences during COVID-19 lockdowns. The recommendations were formulated based on some direct observations which were made as a way forward and some on the problems identified in the introduction.

Table 1

Percentage of Correct Answers by Graduate Architects and Town Planners

No	Indicators	Architects	Town Planners
1	Identifying building codes in practice	9%	4%
2	Identifying effective health and safety standards	14%	21%
3	Use of Sustainable Design considerations	48%	21%
4	Awareness with regard to near zero energy standards	38%	30%
5	Identifying regulations with regards to energy efficiency design	22%	11%

No	Indicators	Architects	Town Planners
6	Awareness of New Urban Agenda of Government	72%	74%
7	Awareness of Paris Agreement on Climate Change	55%	48%

The respondents brought out the following as top four issues facing the built environment:

1. Outdated and poorly implemented building regulations
2. Poor spatial planning
3. Lack of effective built environment legislation
4. Urban sprawl (PCATP, 2020a).

One main reason pointed out by Salama (2020) in "Rethinking architectural education in South Asia" is the mechanistic approach to education that characterizes the university system but does not serve the purpose of learning. Salama proposed a systems approach to architectural education where learning is connected to real processes that take place in the society. Additionally, although the systems approach to Architectural Education is desirable but the university systems with all the formalities of accreditation requirements, credit hours, quality indicators, and the faculty attitudes on one hand and on the other, the obsession with western theories and models of Development, restrict the application of systems approach. From this line of argument, it is clear that unless architectural education in Pakistan is rethought, built environment professionals may not be produced who can contribute towards societal development.

Online Studio

The unexpected switch from on-campus design studios to a virtual alternative with only the basic minimum available resources and appropriate experience caused massive changes in both instructors' and students' approaches of teaching and learning during the COVID-19 lockdown (Alnusairat et al., 2021; Al Maani et al., 2021).

Can online studios introduce or strengthen systems approach in architectural education in Pakistan? Online studios owing to their newness provides a platform to rethink architectural education. This opportunity

provides a means to communicate over long distance. Therefore, this facility provides faculty members with the means to provide students with structured exposure and knowledge and also help them develop skills for online designing, drawing, presentations, and research. In other words, online studios help the students to connect with reality using virtual tools and platforms. At first look, it may appear that the shift to virtual environment would be simple for architectural studios; after all, drawing and modelling could be done and have been done for some time using digital tools (Iranmanesh, & Onur, 2022). However, the design studio provides opportunities, such as peer learning that may be difficult to replicate in a virtual context (Fleischmann, 2019).

Architects' Accreditation Council of Australia (AACA) refers to the conventional design studio pedagogy as based on face-to-face (F2F) and one-on-one instruction method (Architects Accreditation Council of Australia [AACA], 2019). However, as situation and expectations change, the conventional design pedagogy faces challenges. A study of Architects' Accreditation Council of Australia (AACA, 2019) observed some schools strongly sticking to the F2F method, while others were likely to move to a flexible learning method. Curtin University in Western Australia received accreditation for 5-year online program in Bachelors of Applied Sciences (Architectural Science) through open universities Australia. Citing the case of Curtin University, the current study pointed towards strong interest in online education. This is mainly due to the popularity of internet and individual ownership of computers (and now mobiles) with 90% of the universities offering some form of online education and software applications continuously being developed to cater to this form of education.

The online studio, therefore has emerged as a part of distance learning program. When it came to setting up their studios online, as mandated by COVID-19, design studios have seen a contribution from technology that was previously unheard of (Hassanpour, 2022).

In Pakistan, where access to technological resources is limited, HEC had restricted universities from employing online education. Allama Iqbal Open University (AIOU) offering distance learning programs relies on city based physical tutorials and on campus examination. Prior to the COVID-19 pandemic and related restrictions on the movement, online studio was farthest from the minds of architectural academia and practice, main reason

being technological limitations. However, during COVID-19 pandemic, when online education system was adopted in the architecture schools, it was necessary to understand the users' preference. Therefore, following hypotheses were tested in the study:

1. Students participated more in online learning than physical learning because they were more satisfied with the online learning experience.
2. Students attended online classes more responsibly and workload and time management was easier in physical learning.
3. Online classes enhanced the process of design and help in achieving good outcome.
4. Online classes could not aid in sustainable practices and also help to use new tools and online learning resources

Pre-Requisites for Conducting Online Studios

While the discussion on online studio was gaining ground, the 'lockdowns' in 2020 in the aftermath of the COVID-19 pandemic forcibly moved the F2F studio online. Different countries and schools responded differently to this forcible closure of F2F studios and the move online. PCATP issued a policy guideline (PCATP, 2020b) in the wake of pandemic to architectural schools for conducting online studios.

The guidelines are as given below:

1. Make organizational resources (course description, timetable, faculty in-charge and learning materials) available on universities' webpage
2. Provide access to digital library, research database, and design software to students
3. Employ plagiarism deterrent software
4. Upload faculty and relevant staffs details on website
5. Redesign and update project and assignment briefs keeping in view the limitations due to lockdown
6. Upload students' electronic portfolios on webpage for review by PCATP
7. Reduce and limit field based data collection and support electronic based data collection during lockdown

8. Share the list of students with contact information and their level of access to computing and internet facilities
9. Put the final year batches on priority for readiness of online classes
10. Prepare strategy for online classes

The guidelines were made for distance learning and applied to an emergency situation, hoping that normal studios would return once the pandemic was over.

Architect Gyanendra Singh Shekhawat, director, founder, and principal architect of Ideas in "Rethinking Architectural Education in South Asia" (Shekhawat, 2020) found the impacts of COVID-19 pandemic to be a 'constructive disruptor'. Shekhawat argued that the lockdown halted the academia, forcing it to quickly move to online education and the academia moved online to maintain continuity. Moreover, he also suggested to add subjects, such as resilience, disaster management, urban planning and design, heritage conservation, sustainability, and Information Technology (IT) into the curriculum which are necessary to train the architects in building resilience and maintaining identity. He also listed the technology used to enable online education, viz.

1. Online teaching and learning apps
2. Video conferencing
3. Audio recorded presentations
4. Social media with and without live streaming
5. Videos produced by faculty members in house and through external sources
6. E-learning platforms of own institution
7. Private distribution of self-made videos and tutorials

Professor Valina Geropanta (Geropanta, 2020) emphasized the need to integrate technology into architectural education.. She observed that technology is changing the lifestyle and businesses and also cited the example of Kodak becoming obsolete and IPhone taking over the image market. Through such examples, she advocated for the need to popularize online education experiences. She advocated for cities and communities to be viewed as contributors to architectural education and the need to shift

setting from ideal to real life, especially now that technology is making it possible and the pandemic is providing the opportunity. The use of data and images on the internet makes it possible and easy for academia to access real situation worldwide through the internet.

Learning from Case Studies

In almost all the architectural and planning schools across Pakistan, the main issue with technology on the demand side was access to online communication technology, both in terms of availability and accessibility. On the supply side, the choice of platform based on connectivity and affordability emerged as a primary concern. Engineering universities preferred Google classroom or MS Teams where lecturing and presentations were considered important, while art based institutions explored all forms of platforms including various Google platforms. Discussions with faculty members show that the choice of platform was dependent not only on access and affordability for both students and faculty members but also the ease of use and familiarity and information security along with the ability to control the environment.

Table 2

Tools and Platforms Employed in Online Studios

No	Initial Problems	SSUET	NED	IVSAA
1	Familiarity with system	Low	Low	Medium
2	Communication Issues	High and no connection with remote areas	Medium	Medium
3	Presentations	PPT through Window sharing	PPT through Window sharing	PPT through Window sharing
4	Studio Critique	Verbal critique only	Could critique online thru drawing	Could critique online thru drawing
5	Research	Google Earth and You Tube	WhatsApp groups	You Tube

Faculty members received training on the use of platforms and in turn guided the students in the use of platform in the studios. Some faculty members and few students invested in tablets and styluses. Others did it with PowerPoint presentations and quick editing on it. Screen sharing became compulsory for design studios but online F2F conversations were almost negligible and avoided. One main reason for avoiding was the low bandwidth and the second was privacy issues due to work from home. Due to bandwidth issues, faculty members and students preferred one on one, however, attendance requirements forced faculty members to include others in the group in the virtual studio as well. Connectivity remained a serious issue. Connectivity issue had two main aspects including the frequent line dropping and second was electricity outages. Students mainly used mobiles for connectivity and many of them kept their mobiles and laptops charged to attend studios. The one-on-one virtual studio from home facilitated discussion at all times, depending on connectivity and ease. These unscheduled meetings became difficult for faculty members to manage in the long run. Students and faculty were required to have a computer, good internet, headset, camera, and a quiet place for attending design studio.

At the time of break out of pandemic, architectural schools did not have facilities in terms of online education. Within two months, the universities moved quickly to prepare the policies, system, IT infrastructure, faculty and students, online resources and oversight arrangements.

Three case studies were conducted to understand the technicalities of conducting online studios. At NED university, online studio continued after the summer break and they used Google classrooms for studio. Google earth and maps were used for site analysis. However, during lockdown relaxation periods, students visits the sites and feeling of real processes. The case studies looked at:

1. Pre-requisites
2. Initial problems and how they were overcome
3. Online Instructions and Critique
4. Online Assessment and Juries
5. Architectural Research
6. Looking Forward

The main pre-requisites were those laid down by HEC. These included:

1. Formulation of policies on online education including formation of online academic council for approval of policies and procedures
2. Setting up systems including IT readiness, surveys, and monitoring systems along with timetables and scheduling
3. Faculty training and developing online learning resources including library and learning materials
4. Student facilitation and consultation so as to provide students with necessary facilities to study online

Table 3
Implementing the Pre-requisites

No	Pre-requisites	SSUET	NED	IVSAA
1	Formulation of Policies	As per HEC	As per HEC	As per HEC
2	IT System	MS Teams	Google Classroom	Zoom
3	Online Learning Resources	VLE	VLE and online library	Online Library
4	Faculty Training for online classes	Structured for theory	Structured for theory	Open
5	Student facilitation	WhatsApp groups	WhatsApp groups	WhatsApp groups

These pre-requisites were met with in order to start functioning online. The major problems that arose during the initial period were dealt with related to technology. Procedures and policies were developed to resolve the issues and provide back up support to the students. Initial problems were mostly due to the absence of faculty and students' familiarity with online education tools and platforms and their access to reliable internet facilities. Online instructions and critique was done through Teams. For this purpose, faculty and student identities and email were created and then registered on Teams by classes. At one time, 15 students were registered for each Team in design classes, however, due to privacy considerations F2F discussions were avoided and much of the instructions and critique was done through window sharing. Since students and faculty members did not have tablets

and the blackboard was not well integrated with the Teams, many of the critiques were conducted on Zoom. The absence of F2F communication created difficulties in communication. In providing instructions and precedence studies, faculty members used YouTube, online libraries, and PowerPoint presentations. These supplemented and in many cases helped the students to better understand the real life situations and history of architecture.

Online assessments of theory course and juries for design courses were also carried out online. Students were provided with extra time for downloading and uploading purposes. Examinations were conducted in NED University with camera switched on to prevent cheating. Juries conducted online improved in quality over time. At SSUET, initial online juries were held in June 2020 to assess the work done in F2F studios. The junior batches fared well but the final year (9^{th} semester) thesis students were unable to give the juries online. PCATP policies prevented final year juries from being conducted online and therefore final year assessments were delayed till the end of September when F2F juries could be held. NED University's final year presentations were also held in late September and the presentations were held in physical mode. One faculty member remarked that students made physical presentations in shorter time because of practice in virtual studios. There was some hesitancy from jurors; however, all schools admitted that getting jurors even from abroad is easier online. Depending upon the nature of the project, juries did not take up much time. In juries, some furors insisted on F2F communication and view of physical models through camera. Online juries encouraged the students to make videos of their presentations beforehand and this helped to manage time better online.

Architectural field research was greatly affected. Due to lockdown, students were unable to carry out site visits. This was overcome by use of satellite images using Google Earth. This software enabled the students and faculty to carry out mapping and develop understanding of the context. Interviews were also conducted using online platforms, such as Zoom with architects and stakeholders. Students employed online survey facilities, such as Google Forms to carry out survey.. Students also used social media platforms, such as Facebook to reach out to people. The main form of research was conducted through internet browsing using platforms, such as Google search. This helped students to download case studies,

presentations, papers and documents. Majority of the students also used You Tube channels, Facebook groups, and case studies and information available on different websites for their research work.

The online experience during COVID-19 lockdowns introduced students and faculty members to various online platforms, websites, and search engines. This helped to extend their outreach and enabled communication with experts, stakeholders, and practicing architects. Moreover, students were also able to manage interaction with faculty members beyond the office timing and female faculty members also enjoyed scheduling classes in different timings. However, going forward, students and faculty members are happy to be back in studios. There is a general consensus that online mode should be supplemental to the physical studios in order to enhance architectural learning rather than the other way around.

Table 4. Chi-Square test for the relationship between preferences for online design studio and physical design studio vs learning and distant educational tools. The results from the Chi-square test showed that students expressed the lowest satisfaction with participation in learning in online design studio and its relation to physical studio, of the three dimensions, tutoring assistance, design critique, teamwork and peer learning (χ^2 =3.103, df = 3, p < .05). Thus, the null hypothesis “students participated more in online learning than physical learning because they are more satisfied with the online learning experience" was rejected based on the Chi-square test. For the second variable, that is, learning autonomy, there is a significant relationship between the responsibility to attend classes with the workload management and the preference of online studio or physical studio (χ^2 = .017, df = 1, p < .05). These results indicated that the students show more responsibility to attend the physical classes, however, time and workload management were good in online studio and classes. Hence, the second hypotheses “students attended online classes more responsibly and workload and time management was easier in physical learning” was rejected. Since design challenges are frequently unclear and poorly structured, it is usual for students to feel lost and uncertain in online studios. Students may be confused by the nature of the activities they must take because of the special nature of the design challenges and a lack of architectural understanding, which causes them to feel helpless. Therefore, they prefer physical studios than online studios.

Table 4
Preferences of Students, N=*70*

Variables/ indicators	Characteristics	Preferences of people		χ^2	*p*Value	Null Hypothesis
		View about online design studio	View about physical design studio			
Participation in learning	Tutoring assistance	24	46			
	Design critique	11	59			
	Teamwork and peer learning	21	49			
Total				3.103	0.00001	Rejected
Learning autonomy	Responsibility to attend classes	38	32			
	Workload and management of time	44	26			
Total				.017	0.00001	Rejected
Leaning quality	Design final product	18	52			
	Process of design	14	56			
Total				1.794	0.00001	Rejected
Learning behavior	Sustainable practices	55	15			
	Adoption of online learning resources	30	40			
Total				.366	0.00001	Rejected

In terms of learning quality and its two dimensions, number of the setting, delivering effective courses, and programs requires a high level of quality. Online learning settings, such as the design studio, cannot overlook either the temporal needs of students (that is, a commitment to assist students and provide timely service) or physical (that is, the presence of learning resources, staff, and equipment). Furthermore, the effectiveness of courses is assessed by measuring the student performance against learning objectives. In this study, the effectiveness of online design learning was assessed by examining how well students could produce work that was on par with expectations and learn new abilities. Only 38.5% of the students, according to the data, were pleased with their learning and design outcomes. The results showed a significant relationship between the preference of physical studio with the good design process and quality design final product ($\chi^2 = 1.794$, $df = 1$, $p < .05$) with the rejection of hypothesis "online classes enhanced process of design and help in achieving good outcome".

The only area that was thought to have benefited from the shift to online learning was sustainable practices. To study, examine, and show their work, students from multiple universities were pushed to rely more heavily on digital models which were poorly executed by first- and second-year students. The results of 4th variable, ($\chi^2 = .366$, $df = 1$, $p < .05$) also showed that the online classes aid in sustainable practices and also help to use new tools and online learning resources. Students saved money and paper used to print the sheets and panels. Additionally, there was an opportunity to learn more online tools of learning. During COVID-19, Zoom and Microsoft Teams were the most often used online learning tools in Pakistani institutions (47% of architectural programs used Zoom, 38% used Microsoft Teams, and 15% used other tools including Skype and Google Hangout). Zoom was viewed as being user-friendly by the participants, however, Microsoft Teams was thought to be more secure.

Analyzing Advantages and Disadvantages of Online Studio

The main advantages of online or virtual studio seen as important by all interviewed with regard to the learning process beneficial for the society are:

1. The ability to connect with expertise and people worldwide, and
2. Access massive amount of information – data and images and analytical studies.

For online studios, expertise and people in different continents were accessed; people from different fields could attend webinars and discussions and participate in consultations, juries and trainings. The subsidies and discounts offered for online training, workshops, use of platforms, and the arrangements made for transmission of the proceedings and events helped to connect people and exhibit and view projects and works across the globe. These were easily recorded, documented, and made available for viewing at later stages. Schools in Pakistan organized juries with international jurors, had studio inputs from people living in different cities and directly connected with the project, and mapped and viewed project sites and conducted case studies without having to step out of home. This ability is still being employed to bring rich experiences and insights to students.

Students and faculty had the time during lockdown to explore and discover new sites, new ways to approach architectural design and problem solving along with developing critical thinking for problem solving. Technology during lockdown helped academia to gain information, knowledge, and exposure available worldwide online systematically and apply it to reflect upon and discuss problems and solutions. This opened up doors to rethinking studios and all the faculty members suggest continued use of the system in a hybrid form, that is, virtual and F2F together.

Clearly, the electronic media gave people, even those not directly concerned with architecture and planning and other built environment academia and professions to upload, share, discuss, and present their point of view on development. People evicted or displaced during the pandemic made use of the trend to present their case to the academia and professionals using the social media, that is, WhatsApp groups, YouTube, Twitter, Facebook, and other platforms. Despite lockdown, joint action and advocacy were made possible using electronic media. This thinking and way of working help to reduce cost and increase outreach to young people who may not be able to join universities. It seems that architectural academia is pregnant with the Community studio which could grow up well to engage architectural practices, users and clients, and other stakeholders, such as building control regulatory bodies with architectural academia.

One of the main disadvantages of online studio included the home based setting in which students and faculty members accessed online studios. Being home based disturbed privacy and the disturbances at home made it

difficult for both the learners and faculty members to communicate effectively. Moreover, due to privacy concerns, cameras were kept off and therefore the students' attention could not be controlled by the faculty members. Online studios also did not help students to learn in groups. Matching time became difficult and this became all the more difficult due to power outages and dropping off of internet connections.

Lockdown turned the virtual space into reality and many issues and problems previously ignored, came to the forefront. People shifted their focus to social media from official and mass media for learning and demonstration purposes. The electronic media access is dependent on Internet Service Providers (ISP) and commercial media. Governments, particularly Government of Pakistan has moved to restrict social media action and new regulations seek to curtail freedom of expression. Till now, this has not reduced the increasing rate of sharing, however, users have become cautious in making observations and freely commenting on issues and thus use of academic freedom is affected.

Another downside is the overloaded information. The discussions lose focus as students and faculty members' posts are not directly relevant to the topic. Users in different groups are seen asking "Is this Architecture?". There are many voices, many perspectives, and many subjects and everyone has a "professional" opinion based on 2 minutes browsing and reading 10 forwarded messages. This "expediency knowledge" has made systematic studio critique difficult. Online architectural studios have become victim to this trend and many professional and design studio WhatsApp groups are flooded with messages, images, and stories that have little relevance to the exercise at hand.. Another related difficulty is the increasing cases of plagiarism.

One other major drawback is that virtual meetings socially alienate the students and faculty members tend to affect the warmth of relationship. The trauma of Pandemic and lockdowns without the ability to effectively communicate cause much psychological and physical health issues.

Results

The findings of the students' survey suggested that they were not very much satisfied with their online learning experiences. Just 45% of the students said that they were satisfied with their situations. Additionally, only 32% of the students said that they were engaged throughout the term. Similar

numbers (36%) said they developed the ability to learn on their own, whereas just 34% were happy with the quality of the education they received during the pandemic. Around three-quarters of the participants (77%) stated that they were using more online resources and relying on sustainable and recycled materials for their design projects, demonstrating a favorable attitude towards learning behaviors.

To summarize, it is evident that the fundamental requirements for successful online learning are the availability and accessibility of affordable and reliable computer and internet facilities. Without seamless internet access and consistent electrical supply, online studios would be rendered ineffective. While some universities and schools possess adequate computer and internet resources, this is not universally true. Unfortunately, students in rural and remote areas often lack access to such facilities, thus raising concerns about equity. The second prerequisite revolves around the cultural context and technological proficiency of both faculty members and students. Research indicates that a significant number of individuals are still in the process of learning technology and are not yet proficient. Moreover, many lack essential equipment like tablets and affordable platforms with integrated drawing software. Consequently, the current study concludes that Pakistan does not possess affordable, accessible, and readily available technology to be employed as the primary platform for learning architectural studio online. However, the benefits of online learning experiences during COVID-19 lockdowns underscore the need to encourage and utilize online learning resources, platforms, and culture as a complementary component to face-to-face studios. A hybrid system of learning that brings F2F and online platforms together is optimal for Pakistan.

Recommendations

The main recommendations that emerged from the online experiences are stated below.

1. Building upon the COVID-19 lockdown, online experiences and schools should improve their internet connectivity and computer software and hardware capabilities.
2. The potentials of online education, such as those given below, should be realized by schools in a more coordinated manner to supplement physical studios

a. engaging jurors in different parts of the country and the world.

b. Online architectural research should employ facilities, such as satellite images, case studies, videos.

c. Online seminars for students and faculty members.

d. Flexible studio hours to allow off-class timing and faculty-student interaction.

e. Upload learning materials, provide access to online libraries, and resources and archive student projects.

3. Architectural studio pedagogy should be reconsidered based on the online facilities available for architectural research, instructions, and assessments. The studio instructor should transform into a facilitator and coordinators should help students to access resources and learn, rather than instruct and criticize only.

4. Curriculum and semester rules should be revised to bring architectural learning closer to real world problems and issues.

5. Institute of Architects Pakistan (IAP) and schools, through IAP Board of Architectural Education, can bring practitioners and academics closer and create a bond between architecture with the construction, creative arts, and development sectors.

6. PCATP should support schools in preparing affordable distance learning in architecture for youths who cannot access architectural education due to distance. This would increase the ratio of architects per population in Pakistan.

7. PCATP and IAP should develop regular online professional education program for architects and town planners, as this would provide flexibility of time and overcome distance issues.

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Appendix (Results of Chi-Square Test)

Participation in Learning vs Preference of Online and Physical Studio

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.103[a]	3	.376
Likelihood Ratio	3.232	3	.357
N of Valid Cases	70		

Learning Autonomy vs Preference of Online and Physical Studio

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	.017[a]	1	.897
Continuity Correction[b]	.000	1	1.000
Likelihood Ratio	.017	1	.897
Fisher's Exact Test			
N of Valid Cases	70		

Note. b Computed only for a 2x2 table

Leaning Quality vs Preference of Online and Physical Studio

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.794[a]	1	.180
Continuity Correction[b]	.945	1	.331
Likelihood Ratio	1.807	1	.179
Fisher's Exact Test			
N of Valid Cases	70		

Note. b Computed only for a 2x2 table

Learning Behavior vs Preference of Online and Physical Studio

	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	.366[a]	1	.545
Continuity Correction[b]	.056	1	.812
Likelihood Ratio	.366	1	.545
Fisher's Exact Test			
N of Valid Cases	70		

Note. b Computed only for a 2x2 table